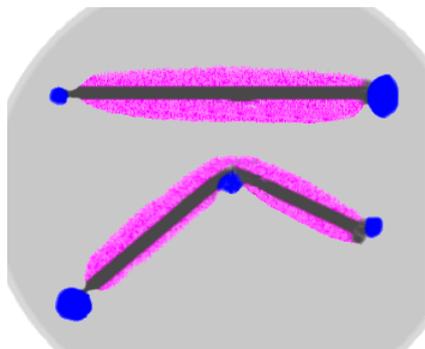


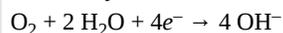
16.9: Corrosion Gallery

Corrosion gallery



Corrosion of a nail

The nails are immersed in agar which forms a moist solid gel. The agar also contains phenolphthalein and hexacyanoiron(III) $\text{Fe}(\text{CN})_6^-$ which forms a deep blue color ("prussian blue") in the presence of Fe^{2+} . The blue colors are clearly associated with those parts of the nail that have been stressed, thus facilitating the anodic release of Fe^{2+} from the metal. The the pink color shows the cathodic regions that have been made alkaline by the reaction



This clearly shows the separation between the anodic and cathodic processes in corrosion.

[Illustration from U of West Indies: [link](#)]

Water distribution main

If you live in the older part of a city where the mains are 50-100 years old, the water you drink may well have passed through a pipe in this condition! Severe corrosion like this is more common in areas where the water is acidic. Such water comes from mountain snowmelt and runoff, and usually acquires its acidity from dissolved atmospheric carbon dioxide.

Waters from rivers, lakes, and especially groundwaters from wells have usually been in sufficiently long contact with carbonate-containing sediments to have been neutralized. Water-works administrators like to make the water slightly alkaline and slightly supersaturated in calcium carbonate in order to maintain a thin coating of solid carbonate on the interior of the pipe which acts to protect it from corrosion.



Corrosion of reinforcing bars in concrete

All large concrete structures contain steel reinforcing bars ("rebars") that help ensure structural integrity under varying load conditions and especially during earthquakes. Intrusion of water, even in the form of fog or mists, can lead to serious corrosion damage, as seen in this picture of this column which supports a highway overpass.

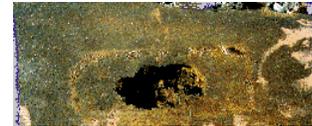


Corrosion at metallic joints

The picture shows two steel structural members joined by cast iron flanges which have been bolted together. For some reason, one of the pieces has become more anodic than the other, leading to extensive corrosion of the upper part.

Bacterial-assisted corrosion

This gas pipe was buried in a red soil that contained iron pyrites (FeS.) The bacterium *thiobacillus ferrooxidans* derives its energy by oxidizing Fe^{2+} to the more soluble Fe^{3+} , transferring the electrons to O_2 . It also oxidizes the sulfur, producing sulfuric acid. The resulting chemical cocktail has eaten a hole into the pipe.



[link](#)

These galvanized bolts were used to join wooden beams together. Subsequent movement of the beams due to varying load conditions abraded the zinc coating. A lack of oxygen near the centers of the bolts also likely contributed to the corrosion by preventing the formation of a protective oxide film.



Pitting corrosion



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